

MARK F. RADOM

60 East 42nd Street, Suite 1812
New York, NY 10165
TEL 973 438 2864 FAX 404 759 2161
mfradom@gmail.com

RECEIVED

NOV 14 A 0 43

November 1, 2007

BY POST

Paul Dudek

Office of International Corporate Finance
Securities and Exchange Commission
Room 3010 (stop 0302)
450 Fifth Street, N.W.
Washington, D.C. 20549

SUPPL



07027933

Re: Chorus Motors plc and WheelTug plc
Information Furnished Pursuant to Rule 12g3-2(b)
Under the Securities Exchange Act of 1934

Dear Ladies and Gentleman:

I am acting as United States counsel to Chorus Motors plc and WheelTug plc (collectively, the "*Companies*"), each of which has been granted an exemption from Section 12(g) of the Securities Exchange Act of 1934, as amended (the "*Exchange Act*") pursuant to Rule 12g3-2(b) of the Exchange Act. The relevant file numbers are Chorus Motors – 82-35051 and WheelTug plc – 82-35108. In furtherance of such exemption, I hereby enclose, on behalf of each of the Companies, the following press releases, which were either issued or adopted (and posted on their respective websites) by such companies: (i) WheelTug Completes Certification Team: Addition of Newport Aeronautical Marks the Beginning of FAA Certification Effort for WheelTg dated September 10, 2007, (ii) Firm Moves to Seek Approval for Fuel-Saving Jet Motors dated September 10, 2007 and (iii) Electric WheelTug System to Move Planse on the Ground dated October 26, 2007.

If you have any questions with regard to this information, please contact me at 973 438 2864 or mark.radom@outsidecounsel.net.

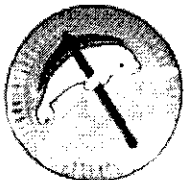
Yours faithfully,

Mark Radom

PROCESSED

NOV 19 2007
THOMSON
FINANCIAL

See 11/15



WHEELTUG PLC

RECEIVED

2007 NOV 14 A 8:43

OFFICE OF INTERNATIONAL
CORPORATION

Sep 10, 2007 00:01 ET

WheelTug Completes Certification Team

Addition of Newport Aeronautical Marks the Beginning of FAA Certification Effort for WheelTug®

NORTH PLAINS, OR--(Marketwire - September 10, 2007) - WheelTug Limited is pleased to announce the addition of Newport Aeronautical Development, Inc. to its certification team. WheelTug® certification work is commencing now, and Newport will provide a turnkey service to ensure that WheelTug meets Federal Aviation Administration (FAA) standards for a Supplemental Type Certificate (STC). An STC is a document issued by the FAA approving a product (aircraft, engine, or propeller) modification. This will allow WheelTug to supply customers such as Delta Air Lines with WheelTug units for their Boeing 737 fleet.

Highlighted Links

www.chorusrmotors.gi
www.borealis.gi

"We are delighted to be working with Newport Aeronautical," said Isaiah Cox, WheelTug's CEO. "They are a world class organization, with a superb track record of working closely with their clients and the FAA to achieve excellent results. We will also continue to be advised by Gil Thompson, who joined the team in May to advise WheelTug management on the certification process, and who recommended Newport Aeronautical as the ideal partner for us. Our certification team is now complete, and good to go."

"Newport Aeronautical Development is pleased to assist with the FAA certification of such an environmentally significant product," stated Anders Folkedal, President of Newport Aeronautical Development.

The proprietary WheelTug technology is designed to allow airplanes to taxi without using their main engines, saving expensive jet fuel and reducing harmful emissions. The technology consists of special high-torque AC electric motors in the nosewheel hub that can drive the aircraft without the need for external tugs. In tests, a prototype WheelTug module moved a fully loaded Boeing 767 in a series of maneuvers similar to those performed by commercial aircraft.

WheelTug and Delta Air Lines recently entered into an agreement in which the airline will assist WheelTug in developing the system and be the launch customer for the 737NG WheelTug worldwide, with the right to acquire WheelTugs for its own 737NG fleet. The agreement also gives Delta the right of first refusal to provide installation and maintenance services on WheelTug systems in the United States for itself and for other airlines that desire such services. Delta has also taken an option to buy up to 600,000 shares of WheelTug plc at an average price of \$36 per share.

Newport Aeronautical has a rich history in the development of joint ventures for profitable combination of resources, both domestic and international, in aircraft manufacture and modification in the following areas:

- FAA Supplemental Type Certificates (STCs) for transport category major aircraft modifications, structural, interior, cockpit and systems.
- Marketing of development products and services for various clients.
- Project planning and management.
- Certification and flight test program plans.
- Preliminary engineering design trade-off studies, concepts and layouts.

- W)
1. WheelTug/FAA approved Project Specific Certification Plan (PSCP) within six months.
 2. WheelTug B737NG Supplemental Type Certificate (STC), Instructions for Continued Airworthiness (Maintenance Manuals) and accompanying components Parts Manufacturer Approvals (PMAs) issued by December 2009. It is the intention to certify WheelTug for all members of the 737NG family, from the 737-600 through to the 737-900ER.
 3. European Aviation Safety Agency (EASA) reciprocal EASA STC, and Transport Canada Civil Aviation reciprocal TCCA STC issued concurrently, or within 60 days, of FAA STC issuance.
 4. B737NG Master Minimum Equipment List (MMEL) revised to allow dispatch with WheelTug system inoperative within 90 days of FAA STC issuance.
 5. Set foundation of positive partnership with FAA to facilitate success of future WheelTug system installations on other aircraft.

Among the potential benefits of the WheelTug system are reduced fuel consumption, noise and emissions, shorter aircraft turnaround times between flights and a reduction in flight delays. The congested nature of many international airports also means that eliminating the frequent use of tugs to haul aircraft could also make a positive impact on airside safety.

WheelTug Limited is a 100% owned subsidiary of WheelTug plc, which is in turn a majority-owned subsidiary of Chorus Motors plc (PINKSHEETS: CHOMF). Chorus has developed the proprietary Chorus® Star and Chorus® Meshcon™ electric motor technologies, which offer substantial performance improvements over comparable motor and drive systems. The Chorus systems produce high torque at start-up speeds and are ideal for traction applications besides aircraft, including automobiles, trucks, locomotives, and ships. WheelTug® and Chorus® are registered trademarks of Borealis Technical Limited. Please visit WheelTug's website at <http://www.wheeltug.com> and read the forward-looking statement at <http://www.wheeltug.com/fls.shtml>.

For further information please contact:

Chris Bourne
Head of Public Relations
+44 (0)20 7993 4293
Email Contact

Privacy Statement | Terms of Service | Sitemap | © 2007 Marketwire, Incorporated. All rights reserved.
1-800-774-9473 (US) | 1-888-299-0338 (Canada) | +44-20-7562-6550 (UK)

Firm Moves to Seek Approval For Fuel-Saving Jet Motors

By J. LYNN LUNSFORD

September 10, 2007

A company that is developing a novel electric motor that is powerful enough to enable jetliners to taxi to and from the runways without running gas-guzzling engines says it plans to make the devices available for Boeing 737 jetliners by the end of 2009.

WheelTug Inc. is expected to announce Monday that it has teamed up with Newport Aeronautical Development to formally apply to the Federal Aviation Administration for approval to install the fuel-saving motors on the most heavily used jets in airline fleets.

WheelTug says the motor, when attached permanently to the nosewheel hub of jetliner, is powerful enough to enable pilots to push back from passenger terminals without the use of an external tug and then taxi at speeds of up to 20 miles per hour without firing up the engines. WheelTug is a subsidiary of Gibraltar-based Chorus Motors PLC, which developed the high-torque electric motor at the heart of the system.

... [snip]...

As part of the certification process, WheelTug plans to install the first motors on 737s within the next seven months. After that, the devices will be put through a series of tests to verify that they can stand up to the punishment of airline operations. WheelTug said that after it receives approval for use on 737s, it will immediately begin developing motors to power other types of planes.

Write to J. Lynn Lunsford at lynn.lunsford@wsj.com

Full article may be seen at

<http://online.wsj.com/article/SB118938804229022199.html>

Copyright © 2007 Dow Jones & Company, Inc. All Rights Reserved



Copyright © 2007 Wheeltug plc, All rights reserved.
Wheeltug and Chorus are Registered Trade Marks of Borealis Technical Limited
Forward Looking Statement/Legal Disclaimer

<< Return to Main Page | Print

From the pages of Design News

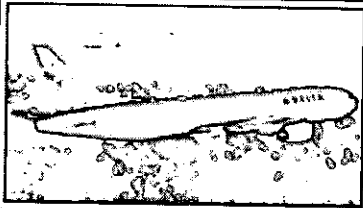
Electric WheelTug System to Move Planes on the Ground

Joseph Ogando, Senior Editor -- 10/26/2007 6:33:00 AM

As much as the flying public dislikes all the time airplanes spend on the tarmac before they take off, the airlines hate all that waiting time even more. It costs them millions of dollars, since their planes burn fuel while creeping to the runway for take-off. A new all-electric integrated tug system promises to make those lines to the runway a little less painful — at least for the airlines.

Based on a patented ac-induction motor from Chorus Motors, this WheelTug system takes its power from the plane's APU and directly drives the nose wheel. It's designed to move regional and larger aircraft on the ground at speeds up to 20 mph without running their turbines or hooking them up to an airport tug.

Video: WheelTug in Action



☒ This video shows the initial WheelTug proof of concept demonstration on a Boeing 767 aircraft owned by Air Canada.

The resulting savings could be huge, which has enticed Delta Airlines to invest in the new technology, initially for its Boeing 737s. "Even a moderately sized fleet could save tens of millions of dollars per year," says Walt Klein, Delta's director of engineering, quality and training. WheelTug's projections put the savings at \$60,000 per month on a typical 737 involved in regional routes according to Isaiah Cox, CEO of WheelTug, which is a subsidiary of Chorus Motors.

All those savings come from a variety of sources. One big one is the direct savings of fuel when the turbines no longer have to push the aircraft to the runway. And there's an indirect savings, too. To account for taxi time, airlines often have to load more fuel onto the plane just for the flight itself. The weight of that extra fuel, if it's not all burned on the ground, poses a secondary drag on fuel economy.

Then consider the cost of airport tugs that also move planes on the ground, particularly near tight gates for safety reasons. "They impose an obvious capital cost," says Cox. And the tugs also burden the airlines with additional maintenance and labor costs.

The installed cost and maintenance of the WheelTug system may offset the potential savings a bit, but probably not by much. Early in the systems' development to quantify the economic case completely, but "we expect the cost to own and operate the system will be a mere fraction of what we save in fuel costs," says Robert Cooney, Delta's engineering manager for 787s, the first plane the WheelTug system targets. He says the weight of the production WheelTug system, predicted to be about 200 lb for a 737, will have a "negligible" effect on fuel burn in the air and save lots of fuel on the ground.

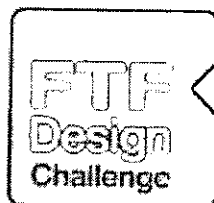
Cox also ticks off a list of other potential benefits from the system, including reductions in greenhouse gas emissions, brake wear and damage to the planes from tugs and turnaround time since ground personnel won't have to wait for engines to cool before working on them.

So if direct drive is such a good idea, why hasn't it happened yet? The idea has been around for years. Until recently, though, motors lacked the torque density to both move a heavy plane and fit in the tight spaces of the nose gear. "Advances in motor technology have now brought the concept close to reality," Klein says. Those advances are good news not just for the airline industry but for any engineer working on torque-hungry mobile applications that don't have a lot of packaging space for electric drives.

Motor Makes It Happen

ADVERTISEMENT

FTF Design Challenge



Create an innovative green design and take center stage at FTF 2008.

Register to win \$50,000



The motor advance that makes the WheelTug possible is the Chorus' patented Meshcon high-phase order AC induction motor. Though patented back in 2000, the motor has just recently become commercially available. Initial general purpose units have a 1 to 20 HP range, though other sizes are in the works.

Some details of the production WheelTug remain up in the air, but the likeliest configuration consists of two Chorus Motor assembles almost entirely nestle into existing space in the opposing nose wheel hubs. Each motor's thin stator mounts on the aircraft's struts, while the rotor and wheel interface mount on the axle. The rotors feature an integrated planetary gear assembly that drives the wheels via the wheel interface.

Cox declined to provide the dimensions, horsepower or its torque-speed curve for the specific motors used in the WheelTug. "It would change based on the size of the aircraft and the expected operating conditions such as taxi speeds," he says.

In an early demo of the WheelTug, a belt-driven configuration with motors mounted outside the wheel, Cox notes, "two Meshcon motors the size of a watermelon moved a 300,000 lb aircraft."

Cox claims the chief advantage of the Meshcon motor in this integrated tug application comes down to its torque density. "Despite the sizing of its electronics, the Meshcon has five to 10 times the torque as a conventional three-phase induction motor of the same size," Cox says.

Meshcon gets that torque, particularly at low speeds, from the company's patented approach to motor and inverter design. They use a mesh connection to connect high-phase-order inverters to the induction motor windings. This mesh connection, in which winding termination connects to both an inverter output and to the termination of a different winding, provides access to a range of V/Hz ratios within the same system. "We can change V/Hz ratios on the fly using the drive electronics," Cox says. "That essentially gives us the ability to use the full inverter capability at both high and low speeds."

In another key aspect of its technology, Chorus enlists the naturally occurring harmonic components of the drive waveform to control V/Hz ratios electronically. In traditional three-phase induction machines, unchecked harmonics can act against the rotating field by the fundamental waveform, dragging down performance. In a multi-phase system, such as the Meshcon, careful design can use harmonics magnetic fields to rotate synchronously with that of the fundamental. By feeding the appropriate harmonics into the system along with the fundamental, Chorus' drive essentially "rewires" the mesh connections to give different V/Hz ratios — and ultimately dictate the torque generated at both high and low speeds. "Think of the harmonics as our gear ratios," says Cox. (Get more info on this harmonic mesh effect).

Engineering Work Remains

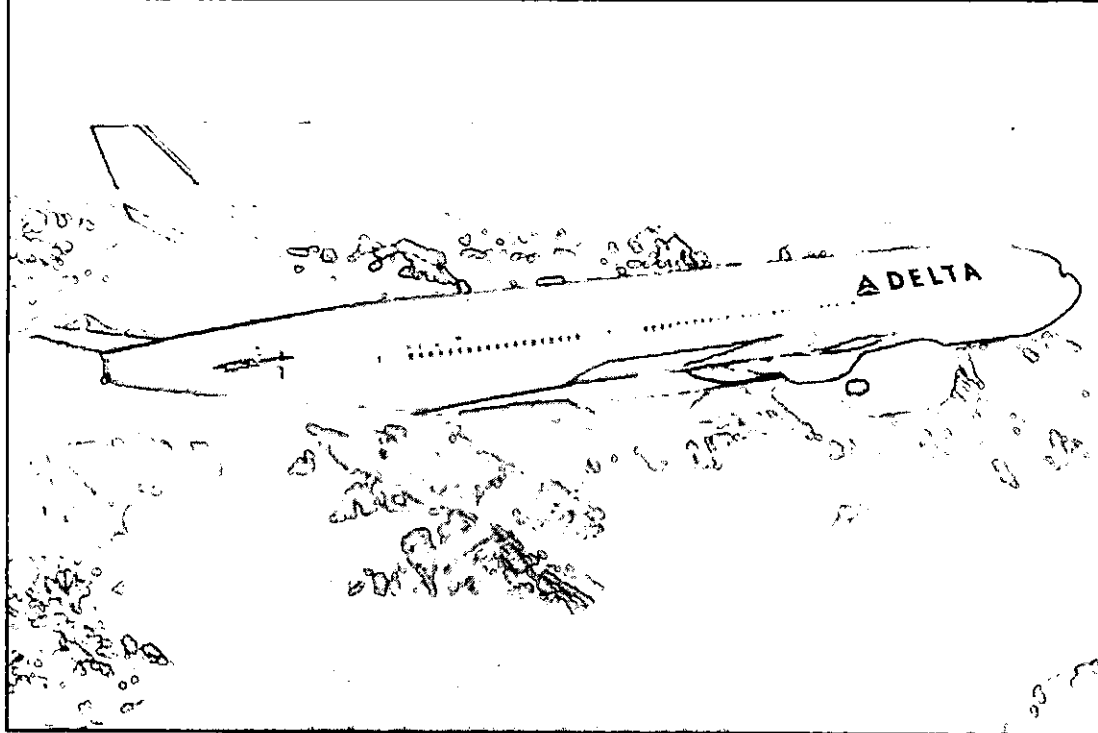
Chorus isn't the only one claiming extra torque density from the Meshcon motor. Delta's engineers have noticed it, too. "I know it will push the aircraft and I'm confident it will fit in the space we have available for it," says Klein.

Even so, Delta and WheelTug have plenty of work to do before the WheelTug launches on Delta's 737NG fleet. According to Cooney, Delta engineers still have to do some of the integration work. Part of that work involves how the WheelTug will be physically interfaced with the wheel and nose gear strut. Delta engineers also have to integrate WheelTug on a systems level. For example, they'll verify the tug system's electrical loads don't overtax the auxiliary power unit. And they'll make sure the system doesn't interfere with the operation of the landing gear. "You have a substantial weight at the end of a pendulum and you want to be sure you can pull it all up into the fuselage," says Cooney.

The fact the system will launch on a 737NG also complicates Delta's validation work somewhat. "That aircraft operates everywhere," says Cooney. So, Delta engineers will have to evaluate its performance in a wide variety of operating conditions that include different surface conditions, gradients and wide swings in temperature.

All of this work will take place as the system goes through its Federal Aviation Administration Certification process over the next few years. Klein estimates the system will earn its certification and be ready to retrofit on Delta's 737s by 2009. "It won't be the most difficult installation we've ever done," says Klein. But it may be one of the most cost-effective. "Financially it's a no-brainer," he says.

GALLERY »



Delta Airlines plans to launch the WheelTug system on Boeing 737s used on regional routes.

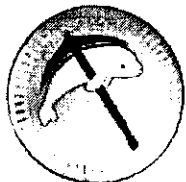
Find a supplier
ac-induction

Click below for more images:

[1](#) [2](#) [3](#) [4](#) [5](#) [6](#)

© Products

© 2007, Reed Business Information, a division of Reed Elsevier Inc. All Rights Reserved.



WHEELTUG PLC

RECEIVED

2007 NOV 14 A 9:13

WHEELTUG PLC
2007 NOV 14 A 9:13

Sep 10, 2007 00:01 ET

WheelTug Completes Certification Team

Addition of Newport Aeronautical Marks the Beginning of FAA Certification Effort for WheelTug®

NORTH PLAINS, OR--(Marketwire - September 10, 2007) - WheelTug Limited is pleased to announce the addition of Newport Aeronautical Development, Inc. to its certification team. WheelTug® certification work is commencing now, and Newport will provide a turnkey service to ensure that WheelTug meets Federal Aviation Administration (FAA) standards for a Supplemental Type Certificate (STC). An STC is a document issued by the FAA approving a product (aircraft, engine, or propeller) modification. This will allow WheelTug to supply customers such as Delta Air Lines with WheelTug units for their Boeing 737 fleet.

Highlighted Links

www.chorusmotors.gi
www.borealis.gi

"We are delighted to be working with Newport Aeronautical," said Isaiah Cox, WheelTug's CEO. "They are a world class organization, with a superb track record of working closely with their clients and the FAA to achieve excellent results. We will also continue to be advised by Gil Thompson, who joined the team in May to advise WheelTug management on the certification process, and who recommended Newport Aeronautical as the ideal partner for us. Our certification team is now complete, and good to go."

"Newport Aeronautical Development is pleased to assist with the FAA certification of such an environmentally significant product," stated Anders Folkedal, President of Newport Aeronautical Development.

The proprietary WheelTug technology is designed to allow airplanes to taxi without using their main engines, saving expensive jet fuel and reducing harmful emissions. The technology consists of special high-torque AC electric motors in the nosewheel hub that can drive the aircraft without the need for external tugs. In tests, a prototype WheelTug module moved a fully loaded Boeing 767 in a series of maneuvers similar to those performed by commercial aircraft.

WheelTug and Delta Air Lines recently entered into an agreement in which the airline will assist WheelTug in developing the system and be the launch customer for the 737NG WheelTug worldwide, with the right to acquire WheelTugs for its own 737NG fleet. The agreement also gives Delta the right of first refusal to provide installation and maintenance services on WheelTug systems in the United States for itself and for other airlines that desire such services. Delta has also taken an option to buy up to 600,000 shares of WheelTug plc at an average price of \$36 per share.

Newport Aeronautical has a rich history in the development of joint ventures for profitable combination of resources, both domestic and international, in aircraft manufacture and modification in the following areas:

- FAA Supplemental Type Certificates (STCs) for transport category major aircraft modifications, structural, interior, cockpit and systems.
- Marketing of development products and services for various clients.
- Project planning and management.
- Certification and flight test program plans.
- Preliminary engineering design trade-off studies, concepts and layouts.

- CM
1. WheelTug/FAA approved Project Specific Certification Plan (PSCP) within six months.
 2. WheelTug B737NG Supplemental Type Certificate (STC), Instructions for Continued Airworthiness (Maintenance Manuals) and accompanying components Parts Manufacturer Approvals (PMAs) issued by December 2009. It is the intention to certify WheelTug for all members of the 737NG family, from the 737-600 through to the 737-900ER.
 3. European Aviation Safety Agency (EASA) reciprocal EASA STC, and Transport Canada Civil Aviation reciprocal TCCA STC issued concurrently, or within 60 days, of FAA STC issuance.
 4. B737NG Master Minimum Equipment List (MMEL) revised to allow dispatch with WheelTug system inoperative within 90 days of FAA STC issuance.
 5. Set foundation of positive partnership with FAA to facilitate success of future WheelTug system installations on other aircraft.

Among the potential benefits of the WheelTug system are reduced fuel consumption, noise and emissions, shorter aircraft turnaround times between flights and a reduction in flight delays. The congested nature of many international airports also means that eliminating the frequent use of tugs to haul aircraft could also make a positive impact on airside safety.

WheelTug Limited is a 100% owned subsidiary of WheelTug plc, which is in turn a majority-owned subsidiary of Chorus Motors plc (PINKSHEETS: CHOMF). Chorus has developed the proprietary Chorus® Star and Chorus® Meshcon™ electric motor technologies, which offer substantial performance improvements over comparable motor and drive systems. The Chorus systems produce high torque at start-up speeds and are ideal for traction applications besides aircraft, including automobiles, trucks, locomotives, and ships. WheelTug® and Chorus® are registered trademarks of Borealis Technical Limited. Please visit WheelTug's website at <http://www.wheeltug.com> and read the forward-looking statement at <http://www.wheeltug.com/fls.shtml>.

For further information please contact:

Chris Bourne
Head of Public Relations
+44 (0)20 7993 4293
Email Contact

Privacy Statement | Terms of Service | Sitemap | © 2007 Marketwire, Incorporated. All rights reserved.
1-800-774-9473 (US) | 1-888-299-0338 (Canada) | +44-20-7562-6550 (UK)

Firm Moves to Seek Approval For Fuel-Saving Jet Motors

By J. LYNN LUNSFORD
September 10, 2007

A company that is developing a novel electric motor that is powerful enough to enable jetliners to taxi to and from the runways without running gas-guzzling engines says it plans to make the devices available for Boeing 737 jetliners by the end of 2009.

WheelTug Inc. is expected to announce Monday that it has teamed up with Newport Aeronautical Development to formally apply to the Federal Aviation Administration for approval to install the fuel-saving motors on the most heavily used jets in airline fleets.

WheelTug says the motor, when attached permanently to the nosewheel hub of jetliner, is powerful enough to enable pilots to push back from passenger terminals without the use of an external tug and then taxi at speeds of up to 20 miles per hour without firing up the engines. WheelTug is a subsidiary of Gibraltar-based Chorus Motors PLC, which developed the high-torque electric motor at the heart of the system.

... [snip]...

As part of the certification process, WheelTug plans to install the first motors on 737s within the next seven months. After that, the devices will be put through a series of tests to verify that they can stand up to the punishment of airline operations. WheelTug said that after it receives approval for use on 737s, it will immediately begin developing motors to power other types of planes.

Write to J. Lynn Lunsford at lynn.lunsford@wsj.com

Full article may be seen at
<http://online.wsj.com/article/SB118938804229022199.html>

Copyright © 2007 Dow Jones & Company, Inc. All Rights Reserved



Copyright © 2007 Wheeltug plc. All rights reserved.
Wheeltug and Chorus are Registered Trade Marks of Borealis Technical
Limited
[Forward Looking Statement/Legal Disclaimer](#)



**SAY GOODBYE TO THE DINOSAURS
OF THE INNOVATION AGE...**

Siemens PLM Sc

SIEME

[<< Return to Main Page](#) | [Print](#)

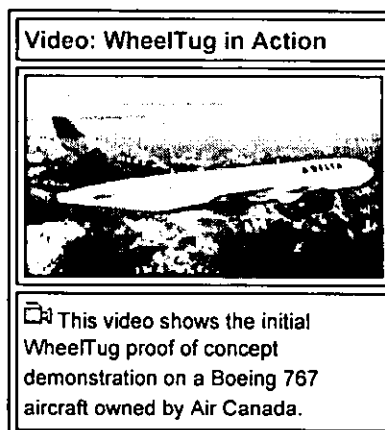
From the pages of Design News

Electric WheelTug System to Move Planes on the Ground

Joseph Ogando, Senior Editor -- 10/26/2007 6:33:00 AM

As much as the flying public dislikes all the time airplanes spend on the tarmac before they take off, the airlines hate all that waiting time even more. It costs them millions of dollars, since their planes burn fuel while creeping to the runway for take-off. A new all-electric integrated tug system promises to make those lines to the runway a little less painful — at least for the airlines.

Based on a patented ac-induction motor from Chorus Motors, this WheelTug system takes its power from the plane's APU and directly drives the nose wheel. It's designed to move regional and larger aircraft on the ground at speeds up to 20 mph without running their turbines or hooking them up to an airport tug.



The resulting savings could be huge, which has enticed Delta Airlines to invest in the new technology, initially for its Boeing 737s. "Even a moderately sized fleet could save tens of millions of dollars per year," says Walt Klein, Delta's director of engineering, quality and training. WheelTug's projections put the savings at \$60,000 per month on a typical 737 involved in regional runs, according to Isa CEO of WheelTug, which is a subsidiary of Chorus Motors.

All those savings come from a variety of sources. One big one is the direct savings of fuel when the turbines no longer have to push the aircraft to the runway. And there's an indirect savings, too. To account for taxi time, airlines often have to load more fuel onto the plane just in case. The weight of that extra fuel, if it's not all burned on the ground, poses a secondary drag on fuel economy.

Then consider the cost of airport tugs that also move planes on the ground, particularly near tight gates for safety reasons. "They impose an obvious capital cost," says Cox. And the tugs also burden the airlines with additional maintenance and labor costs.

The installed cost and maintenance of the WheelTug system may offset the potential savings a bit, but probably not by much. Early in the systems' development to quantify the economic case completely, but "we expect the cost to own and operate the system will be a mere fraction of what we save in fuel costs," says Robert Cooney, Delta's engineering manager for 787s, the first plane the WheelTug system targets. He says the weight of the production WheelTug system, predicted to be about 200 lb for a 737, will "negligible" affect on fuel burn in the air and save lots of fuel on the ground.

Cox also ticks off a list of other potential benefits from the system, including reductions in greenhouse gas emissions, brake wear and damage to the planes from tugs and turnaround time since ground personnel won't have to wait for engines to cool before working on them.

So if direct drive is such a good idea, why hasn't it happened yet? The idea has been around for years. Until recently, though, motors lacked the torque density to both move a heavy plane and fit in the tight spaces of the nose gear. "Advances in motor technology have now brought the concept close to reality," Klein says. Those advances are good news not just for the airline industry but for any engineer working on torque-hungry mobile applications that don't have a lot of packaging space for electric drives.

Motor Makes It Happen

ADVERTISEMENT



The motor advance that makes the WheelTug possible is the Chorus' patented Meshcon high-phase order AC induction motor. Though patented back in 2000, the motor has just recently become commercially available. Initial general purpose units have 1 to 20 HP range, though other sizes are in the works.

Some details of the production WheelTug remain up in the air, but the likeliest configuration consist of two Chorus Motor asser almost entirely nestle into existing space in the opposing nose wheel hubs. Each motor's thin stator mounts on the aircraft's st nose wheel strut, while the rotor and wheel interface mount on the axle. The rotors feature an integrated planetary gear assem the wheels via the wheel interface.

Cox declined to provide the dimensions, horsepower or its torque-speed curve for the specific motors used in the WheelTug. "It would change based on the size of the aircraft and the expected operating conditions such as taxi speeds," he says.

In an early demo of the WheelTug, a belt-driven configuration with motors mounted outside the wheel, Cox notes, "two Meshcon the size of a watermelon moved a 300,000 lb aircraft."

Cox claims the chief advantage of the Meshcon motor in this integrated tug application comes down to its torque density. "Despite the sizing of its electronics, the Meshcon has five to 10 times the torque as a conventional three-phase induction motor of the same size," Cox says.

Meshcon gets that torque, particularly at low speeds, from the company's patented approach to motor and inverter design. They use a mesh connection to connect high-phase-order inverters to the induction motor windings. This mesh connection, in which winding termination connects to both an inverter output and to the termination of a different winding, provides access to a range of ratios within the same system. "We can change V/Hz ratios on the fly using the drive electronics," Cox says. "That essentially gives the ability to use the full inverter capability at both high and low speeds."

In another key aspect of its technology, Chorus enlists the naturally occurring harmonic components of the drive waveform to control V/Hz ratios electronically. In traditional three-phase induction machines, unchecked harmonics can act against the rotating field by the fundamental waveform, dragging down performance. In a multi-phase system, such as the Meshcon, careful design can harmonics magnetic fields to rotate synchronously with that of the fundamental. By feeding the appropriate harmonics into the along with the fundamental, Chorus' drive essentially "rewires" the mesh connections to give different V/Hz ratios — and ultimately dictate the torque generated at both high and low speeds. "Think of the harmonics as our gear ratios," says Cox. (Get more info on this harmonic mesh effect).

Engineering Work Remains

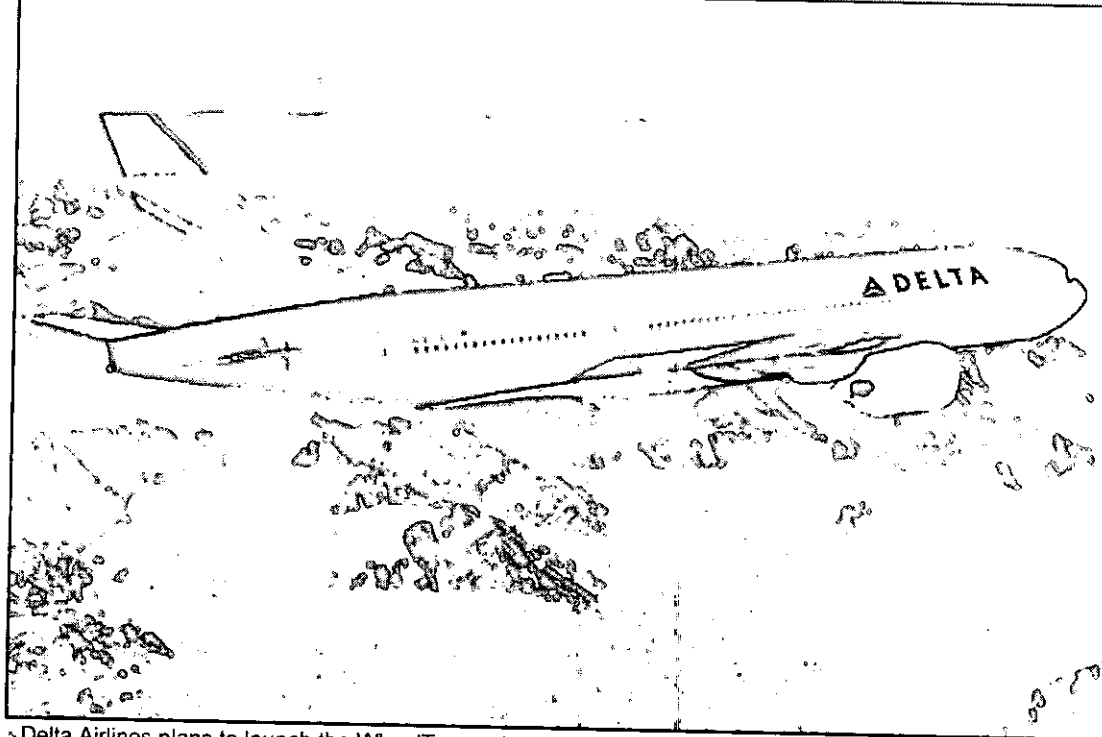
Chorus isn't the only one claiming extra torque density from the Meshcon motor. Delta's engineers have noticed it, too. "I know we will push the aircraft and I'm confident it will fit in the space we have available for it," says Klein.

Even so, Delta and WheelTug have plenty of work to do before the WheelTug launches on Delta's 737NG fleet. According to Cooney, engineers still have to do some of the integration work. Part of that work involves how the WheelTug will be physically interfaced to the wheel and nose gear strut. Delta engineers also have to integrate WheelTug on a systems level. For example, they'll verify the tug system's electrical loads don't overtax the auxiliary power unit. And they'll make sure the system doesn't interfere with the operation of the landing gear. "You have a substantial weight at the end of a pendulum and you want to be sure you can pull it all up into the gear," says Cooney.

The fact the system will launch on a 737NG also complicates Delta's validation work somewhat. "That aircraft operates everywhere," says Cooney. So, Delta engineers will have to evaluate its performance in a wide variety of operating conditions that include different surface conditions, gradients and wide swings in temperature.

All of this work will take place as the system goes through its Federal Aviation Administration Certification process over the next few years. Klein estimates the system will earn its certification and be ready to retrofit on Delta's 737s by 2009. "It won't be the most installation we've ever done," says Klein. But it may be one of the most cost-effective. "Financially it's a no-brainer," he says.

GALLERY »



Delta Airlines plans to launch the WheelTug system on Boeing 737s used on regional routes.

Click below for more images:

[1](#) [2](#) [3](#) [4](#) [5](#) [6](#)

[Find a supplier](#)
[ac-induction](#)

[Products](#)

© 2007, Reed Business Information, a division of Reed Elsevier Inc. All Rights Reserved.

END